

### REMARKS

Claims 1-40 are pending and stand rejected. Claims 39 and 40 are amended by way of this amendment to clarify the subject matter of the invention. All pending claims, as amended, are believed to be allowable over the references cited by the Examiner as discussed below. Accordingly, a Notice of Allowance for the present application is respectfully requested.

### Drawings

FIGS. 9 and 13 were objected to by the Examiner. The Examiner states that they fail to show illustrative results for a digital to analog transformations as described in the specification.

With respect to FIG. 9, FIG. 9 does show an illustrative result for a digital to analog transformation. In particular, FIG. 9 illustrates the transformation of an unprocessed digital image (left image) to a screen-film image made on the same day (right image) and the illustrative result for a digital to analog transformation (middle image). Specifically, as noted in paragraph [0092] of the specification, in FIG. 9, the image on the left is an image to be mapped, the image on the right is the image to which the left image is to be mapped, and the middle image is the *resulting registered or mapped image of the left image*, i.e., an illustrative result for a digital to analog transformation.

With respect to FIGS. 13A-13D, FIG. 13C shows an illustrative result for an analog to digital transformation of the input images in FIGS. 13A and 13B. As noted in paragraph [0094] of the specification, FIGS. 13A and 13B are input images A and B, respectively while FIG. 13C is the result of mapping (analog) image B to (digital) image A.

Thus, it is believed that FIGS. 9 and 13 do show illustrative results for a digital to analog (FIG. 9) and analog to digital (FIG. 13) transformations as described in the specification.

### Specification

The disclosure was objected to by the Examiner. The specification is amended to address the various objections. Specifically, the Abstract is amended and is believed to contain 150 words. The reference to the co-pending application is updated.

The specification has also been amended at paragraphs [0039] and [0068] to capitalize trademarks. The specification has been amended at paragraphs [0037] to correct a typographical error in the description of FIGS. 14A-14D.

**Rejection Under 35 U.S.C. §101**

Claims 39 and 40 stand rejected under 35 U.S.C. §101. Claims 39 and 40 are amended to clarify that the claimed computer program product is embodied on a computer-readable medium.

Withdrawal of the rejection of claims 39 and 40 under 35 U.S.C. §101 is respectfully requested.

**Rejections Under 35 U.S.C. §103(a)**

Claims 1-4, 6-12, 14-17, 19-25, 27, 28, 30, 32-37, 39, and 40 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Giger in view of Doi.

Independent claim 1, as amended, recites a method for grayscale registration of first and second medical images. The method generally includes spatially registering the images, generating at least one joint pixel value histogram based on pixel values of the first and second images, generating a lookup table based at least in part on the joint pixel value histogram, and image acquisition methods for the images, and applying the lookup table to the pixel values of the first medical image to generate a third medical image that is transformed from the first image and registered to the second image.

Giger discloses a method for automated analysis of abnormalities using digital images, including generating image data from respective of digital images derived from a selected portion of an object.

Doi discloses a method for *correcting* a non-linear characteristic of an image. A histogram is produced from digitized data of an input image. A first pixel value characteristic of a variable under which the image was derived is extracted from the histogram. One of several non-linear correction curves (relating original pixel values to corrected pixel values for different degrees of the variable) stored in memory is selected based on the first extracted pixel value and a *predetermined* corrected pixel value. Corrected image data are then formed using the selected correction curve. (See, for example, Abstract.)

With respect to claim 2, the Examiner relies on Giger as teaching generating a joint pixel value histogram of the first and second medical images, citing elements 520 and 530 of FIG. 7. However, as clearly shown in FIG. 7, a separate histogram is generated for each image (generating a histogram 530 of the left image 510 and generating a histogram 540 of the right

image 520). In addition, as explicitly states in Giger, “gray-level histograms are then obtained for each image,” referring to steps 530 and 540 of FIG. 7. (Col. 6, lines 37-38).

Independent claims 14, 27, 39 and 40 similarly recite the generation of a joint pixel value histogram based on pixel values of the first and second medical images. The arguments above similarly apply to independent claims 14, 27, 39 and 40.

Furthermore, with respect to Doi, Doi does not generate a lookup table based on the joint pixel value histogram and the first and second image acquisition methods, as generally recited in the claims. Rather, Doi provides several predetermined lookup tables (correction curves) for different degrees of improper exposure. These lookup tables are independent of Doi’s single input image. Specifically, the histogram of the properly exposed image is derived from a large number of properly exposed images (see, for example, col. 4, lines 36-62). Thus the histogram of the properly exposed image is determined in a manual and empirical manner by examining a statistical distribution of a large number of properly exposed images. Doi generates and stores 16 lookup tables for density correction of improperly exposed radiographs ranging from 1/4 to 4 times the proper exposure levels (see, for example, col. 4, lines 15-20). These predetermined lookup tables are then stored in memory.

To correct for improper exposure, Doi generates a histogram from a single input image and extracts a first pixel value characteristic of a variable under which the single input image was derived. Doi then selects from the predetermined correction curves based on the first extracted pixel value and a predetermined corrected pixel value.

To select from amongst the lookup tables, Doi’s only goal is to examine one particular metric of the single input image and use that metric to choose from among a predetermined set of lookup tables. The particular metric is an estimation of the exposure level. As shown in FIG. 6(a), “one measure is the pixel value that yields the 25% fraction of the lower end (higher optical density) of the gray-level histogram of the image,” i.e., a grayscale level at which 25% of the image pixels are darker and 75% are brighter. (Col. 4, lines 49-52). As Doi explicitly states, “the correction factor for improperly exposed radiographs must be known (or estimated) prior to the use of this nonlinear density-correction technique in order to determine which correction curve to employ for a particular exposure condition.” (Col. 4, lines 30-35).

Doi then performs the grayscale-mapping of the single input image using the selected lookup table such that its histogram resembles the histogram of the empirically-determined properly exposed image.

As is evident, neither Giger nor Doi, alone or in combination, discloses or suggests the generation of a *joint* pixel value histogram based on pixel values of the first and second medical images.

Withdrawal of the rejection of independent claims 1, 14, 27, 39 and 40 as well as claims dependent therefrom under 35 U.S.C. §103(a) is respectfully requested.

Dependent claims 13, 26, and 38 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Giger and Doi in further view of Brecher. However, dependent claims 13, 26, and 38 are believed to be allowable at least because the independent claims 1, 14, and 27 from which they variously depend are allowable as discussed above.

### CONCLUSION

Applicants believe that all pending claims are allowable and respectfully request a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

In the unlikely event that the transmittal letter accompanying this document is separated from this document and the Patent Office determines that an Extension of Time under 37 CFR 1.136 and/or any other relief is required, Applicant hereby petitions for any required relief including Extensions of Time and/or any other relief and authorizes the Commissioner to charge

the cost of such petitions and/or other fees due in connection with the filing of this document to  
Deposit Account No. **50-1217** (Order No. **R2TIP002**).

Respectfully submitted,



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